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U.S. Army Epidemiological Board
Commission on Air-Borne Infections

Study of the Control of Respiratory Disease
by Oiling Floors and Bedding

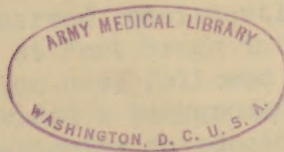
A Joint Report of

The Commission on Air-Borne Infections

and

The Commission on Acute Respiratory Diseases

Army Epidemiological Board, Preventive Medicine Service;
Office of The Surgeon General, United States Army



UNITED STATES DEPARTMENT OF HEALTH
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The Commission on Air-Borne Infections

and

The Commission on Acute Respiratory Diseases

New Epidemiological Board, Preventive Medicine Service
Office of the Surgeon General, United States Army

63-N-47

STUDY OF THE CONTROL OF RESPIRATORY DISEASE BY OILING FLOORS AND BEDDING

Experimental studies of the Commission on Air-Borne Infections have shown that oiling of floors and bedding is an effective procedure for controlling dust and bacterial contamination in the air of barracks and hospital wards. In clinical studies at Camp Carson, Colorado, in 1943-44, considerable evidence was secured that this procedure reduced the incidence of hemolytic streptococcal infections and acute respiratory disease among troops.

At the request of the Army Epidemiological Board a further investigation of the effectiveness of these oiling procedures was undertaken during the winter 1944-45 at Fort Bragg, N.C., where a more extensive control experiment could be carried out. This project was carried on jointly by the Commission on Air-Borne Infections and the Commission on Acute Respiratory Diseases. The former was responsible for carrying out all of the oiling procedures and for testing and maintaining their effectiveness. The latter was responsible for measuring the effect of the procedures on the incidence of respiratory disease. Major Norman Plummer, of the Commission on Influenza was attached to the group for the period of the study.

The study was initiated in October, 1944 and will continue through April, 1945. The present report is based on provisional tabulations of the results obtained through 17 March 1945.

PLAN OF STUDY

The study was undertaken in the Field Artillery Replacement Training Center (FA-RTC) for the following reasons:

1. This organization is composed largely of new recruits in which, during the winter months, a high incidence of respiratory disease has been observed consistently since the initiation of the studies of the Commission at Fort Bragg in October 1942. Respiratory diseases in this organization have followed a characteristic epidemiological pattern which provided a background of experience for interpreting the results and for designing an adequate test.

2. The FA-RTC is a "fixed" organization at Fort Bragg and was expected to receive moderately large shipments of trainees throughout the winter of 1944-45. Thus, an adequate population was available for study.

3. The regularity of the movements of these trainees, the ready accessibility of personnel records, the high standard of medical care

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provided in the dispensaries and the active interest and hearty cooperation of the Commanding General and his staff made the FA-RTC an ideal organization for conducting an investigation.

Six battalions were selected. One of these was disbanded shortly after the study commenced. Each of the remaining 5 battalions was a separate training unit. Recruits for a particular battalion arrived over a period of 7 to 14 days from reception centers in all parts of the country. They received 17 weeks of basic training as a group. When the training cycle was completed, the men left the study group and new recruits arrived. The movement of troops through the 5 battalions is shown in Table I.

Table I

Approximate Strength, Flow of Men, and Date
of Initiation of Studies in Battalions of the Study Group

Battalion	First Day of Training	Observations Initiated	Approximate Strength
9th	20 August	20 October	1050
5th	1 October	26 October	750
7th	5 November	5 November	1000
8th*	19 November	19 November	800
6th	3 December	3 December	750
9th*	31 December	31 December	1250
5th*	25 February	25 February	1200
7th	18 March	18 March	1000
4th	(Disbanded in November)		

* Battalion studied in detail

Each battalion consisted of 4 batteries. Each battery was provided with 4 standard two-story army barracks designed for 63 men, a supply room, and a mess hall. Batteries A and C of each battalion received the complete oiling treatment, while alternate batteries B and D remained untreated. Thus during the entire period of study, there were 20 batteries under observation, 10 oiled and 10 controls. In several of these batteries 2 separate groups of trainees were under observation.

It was recognized that the alternation by platoon, which is the smallest housing unit, would have advantages over alternation by battery. Such a procedure, however, was impractical for two reasons: 1) The unit of supply was the battery and past experience indicated that under such circumstances treated and untreated blankets become hopelessly mixed. 2) Adequate personnel was not available to keep the detailed records which would be necessary in order to measure the results.

The total strength of the oiled and control groups remained approximately equal throughout the study. Within certain battalions, however, there were several instances where rather marked differences in strength occurred in the oiled and control batteries. These differences may have influenced the results as will be pointed out below. Furthermore, there were differences in geographic origin and length of service of the men in the 2 groups resulting from the method of assignment of trainees to the battalions. During the early part of the study the batteries were filled with trainees starting with Battery A and finishing with Battery D. Later, arrangements were made to have each shipment of trainees divided equally among the 4 batteries, thus providing for a more adequate distribution of the men between the oiled and control groups.

METHODS

A routine procedure was followed for measuring the incidence of respiratory disease in the whole study group and in addition detailed studies were undertaken in selected battalions.

Routine Procedures:

Dispensary cases -- A daily tabulation was maintained of new dispensary cases of respiratory disease according to organization. The severity was indicated by disposition to duty, quarters, or hospital.

Hospital cases -- Each admission to the respiratory, contagious disease, and EENT wards of the Regional Hospital was examined by a member of the Commission. A chest X-ray and throat culture for the β -hemolytic streptococcus were secured. A second throat culture and acute and convalescent blood specimens were obtained from all patients found to harbor hemolytic streptococci on admission.

Population data -- The daily total strength of each battery was ascertained and consolidated into mean weekly strength figures. Also an approximate tabulation was made of the origin and length of service of the men in each battery in order to determine the comparability of the men in the oiled and control groups.

The present report is based largely on tabulation of these routine data.

Detailed Studies:

More extensive observations were made in 3 selected battalions during the study period. The field work in 2 of these has been completed and the third is in progress.

Dispensary cases -- Each dispensary case was seen and treated by a member of the Staff. A throat culture was secured and a record maintained of the temperature, prominent symptoms, history of unusual ex-

posure to weather, and of recent immunization. Presence or absence of exudate in the throat and of rales in the chest were recorded.

Hospital cases -- Throat cultures were examined for pneumococci, staphylococci, H. influenzae, and H. hemolyticus. Acute and 21-day convalescent blood specimens were secured.

Platoon studies -- Weekly interviews and throat cultures were made on 2 platoons of 60 men each; 1 platoon lived in an oiled barrack, the other in a control barrack. These studies provided data on the prevalence of minor respiratory symptoms and of specific bacteria in the throats of well soldiers.

Streptococcus surveys -- In 2 battalions, the 9th and 5th, repeated cultural surveys were made for carriers of hemolytic streptococci. From 1000 to 1200 men were cultured 3 times in each of these battalions.

Population data -- Complete identifying data were collected for cadre and trainees, according to age, geographic origin, length of service in the Army, and residence in upper or lower floor of the platoon. In 2 battalions, data were also collected regarding occupation prior to entry in the Army and history of tonsillectomy.

Only a few preliminary tabulations of these detailed studies will be presented here.

Application of Oil to Floors:

The method of application of oil to floors was similar to that employed by the Commission on Air-Borne Infections during its studies at Camp Carson, Colorado. The oil was distributed over the floor from buckets with perforated bottoms, after which it was spread with hair brooms. A petroleum distillate floor oil which met the specifications of the Bureau of Standards was employed. The oiling of the barracks, mess halls, and the recreation halls in the A and C Batteries of the 4th, 5th, 6th, 7th, 8th, and 9th Battalions was begun 10 October and completed 12 October 1944. This comprised a total of 48 barracks, 12 mess halls, and 5 recreation halls. The personnel for applying oil was supplied by the FA-RTC. From 30 to 35 gallons of oil at a total cost of \$6.50 - \$7.50 were used for each barrack.

Technique for Oiling Bed Clothes:

Dilute emulsions of oil in water were employed in the treatment of the bed clothes. The formula is known as T-13 Emulsion Base, and consisted, by weight, of 87 parts of medicinal mineral oil (Fractol A) and 13 parts triton NE, a neutral detergent, wetting and emulsifying agent. The

bed clothes were rinsed in the same wheel in which they were washed, in dilute T-13 oil emulsions for 10 minutes at the end of the regular washing procedure. The blankets were initially treated in 2 per cent oil emulsion, and the cotton bed clothes in a 1 per cent emulsion. This resulted in an oil-loading of 2.0 to 2.5 per cent of dry weight of the textiles. For retreatment of the blankets and cotton bedding, one-tenth per cent and one-half per cent, respectively, were required to maintain this loading. The cost of the initial treatment of a blanket was approximately 6 cents and of a sheet approximately 1 cent. Post Laundry No. 3 provided all the personnel necessary for the oiling of the bed clothes. Throughout the study, however, one of the Staff of the Commission on Air-Borne Infections supervised the procedures. The details for the use of T-13 oil emulsions for the application of oil to bedding will be submitted in a separate report by the Commission on Air-Borne Infections.

The oiling of bed clothes began 17 October 1944. The blankets of A and C Batteries of the 9th and 5th Battalions were oiled first, and thereafter, those of A and C Batteries of the 7th, 8th, and 6th were treated respectively at the beginning of their training cycles. To date, approximately 14,000 blankets have been oiled. Treatment of cotton bedding began 30 October and thereafter, 2,000 to 3,000 sheets, 1,000 to 1,500 pillow slips, and 250 to 500 mattress covers have been re-oiled weekly since this time. To insure that the bedding contained sufficient oil to hold dust and bacteria, samples from different lots were selected at the time of treatment and analyzed for oil content. Periodic inspections of the barracks were made to see that the treated bedding was properly distributed. With few minor exceptions, the treatment procedures and distribution of the blankets were adequately maintained.

RESULTS

The results will be presented in 4 parts: 1) Effect of the oiling procedures on the environment; 2) Effect on the incidence of respiratory disease; 3) Results of platoon studies; and 4) Results of a survey for hemolytic streptococcus carriers.

1. Effect on Environment

The methods and apparatus employed for the analysis of the bacterial content of the air, blankets, and floor dust were similar to those employed by the Commission on Air-Borne Infections at Camp Carson, Colorado.

Bacterial content of the air -- Periodic samplings of the air from oiled and unoled barracks during the time of maximum activity in the early morning hours, from 5:45 to 7:30 AM, with the Folin bubbler-samplers were made. The air of the oiled barracks consistently yielded from 75 to 90 per cent fewer organisms than were obtained from the air of untreated barracks. Cultures were also made for hemolytic streptococci. None were obtained from 100 air samples (15 to 20 cubic feet) in the treated barracks, while 12 per cent of a comparable number of samples from the unoled

barracks were positive. In general the groups and types of streptococci isolated were similar to those found in the blankets. Attempts to isolate pneumococci from the air using the Folin bubbler-sampler and injecting the broth intraperitoneally into mice were unsuccessful.

Bacteria removed from blankets -- To determine the bacteria-holding property of oiled versus unoled bedding, many cultures were made of the blankets in the treated and control barracks with the Folin bubbler-sampler throughout the training cycles. Cultures from blankets having an oil loading of two or more per cent oil as dry weight, contained from 90 to 95 per cent fewer organisms than did those from unoled blankets. The blankets from a large number of beds were also cultured for hemolytic streptococci. Of 307 cultures from oiled beds, 26 (8.5 per cent) were positive for hemolytic streptococci (Table II). Of 441 samples from unoled beds, 160 (36.3 per cent) yielded streptococci.

Fifty per cent of these strains were Group A, while the remainder were largely Groups C and G. Typable Group A strains were found more frequently from control barracks. The distribution of groups and types of streptococci isolated from blankets and from air was roughly similar to that found in the carrier surveys.

Table II

Beta-Hemolytic Streptococci Isolated
from Blankets in Oiled and Control Barracks

Type of Barracks	Number of Beds Sampled	Beds Positive		Distribution by Lancefield Groups						
		Number	Per cent	*A	**A	B	C	D	F	G
Oiled	307	26	8.5	1	12	0	10	0	1	2
Control	441	160	36.3	16	64	4	50	0	2	24

* Typable ** No Type

Attempts were made to isolate pneumococci from the blanket dust by concentrating the organisms from the broth and injecting them intraperitoneally in mice. None were found. This was unexpected because the carrier rate for pneumococci among the barrack occupants was usually 50 per cent or higher, and type 25 pneumococcus was observed to spread among the men in one platoon during the time when these tests were being carried out. This may indicate that the survival time of pneumococci in barracks is shorter than that of hemolytic streptococci, or that the methods of detection were inadequate.

Reactions of officers and enlisted men -- When the plans for the study were being formulated, some apprehension was expressed concerning the possibility that the barrack occupants would react unfavorably to the oiled floors and bedding. Before approval for the oiling program was given, a "pilot barrack" was set up, and the reaction of the men noted. It was generally favorable. During the course of the study, periodic questioning of enlisted men and battery commanders as to their reactions to the oiled floors, revealed no disapproval. On the other hand, a number of favorable comments were given, such as the improved appearance of the barracks, the simplified cleaning requirements, and the almost complete suppression of dust. Further indication of approval was shown by the request from the Commanding General, FA-RTC, for oil to be applied to several of the headquarters buildings, and to barracks of other organizations in his command.

2. Effect on the Incidence of Respiratory Disease

During the early part of the study (22 October to 30 December) respiratory disease was endemic and only scattered cases occurred. During January, however, the incidence of respiratory disease rose sharply, particularly in hospitalized cases, and the disease was considered to be epidemic in nature. For the purposes of presenting the results of the oiling study, the comparisons between oiled and control groups will be divided into endemic and epidemic periods since the oiling procedures appeared to have a definite effect during the early period but a doubtful effect during the late period. Two sources of information were available for measuring the incidence of respiratory disease: 1) dispensary records and 2) cases seen by a member of the Staff on the respiratory wards of the hospital.

A. Dispensary Records -- The weekly incidence rates of duty, quarters, and hospital cases of respiratory disease are shown in Figure 1 and Tables III and III-A. The rates for duty cases from oiled and control groups were irregular and showed no striking differences. Duty cases represent mild afebrile infections. The great majority of these patients complained of nasal symptoms and cough without exhibiting objective signs of disease. Many factors other than the presence or severity of respiratory symptoms motivate soldiers to report on sick call and to claim that they have a "cold." An accurate diagnosis in such cases is most difficult. It is felt that the incidence of duty cases is one of the least reliable measures of respiratory disease among soldiers.

A more accurate diagnosis can be made in the patients who are sent to quarters or admitted to the hospital because these patients usually present objective signs of disease, such as fever, exudate in the throat, or rales in the lungs. Furthermore, these cases represent the important group of infections because they are severe enough to result in loss of time from training.

FIGURE 1

WEEKLY INCIDENCE RATES OF RESPIRATORY DISEASES
DUTY, QUARTERS, AND HOSPITAL CASES FROM OIL-TREATED AND CONTROL GROUPS
OCTOBER 15, 1944 to JANUARY 27, 1945

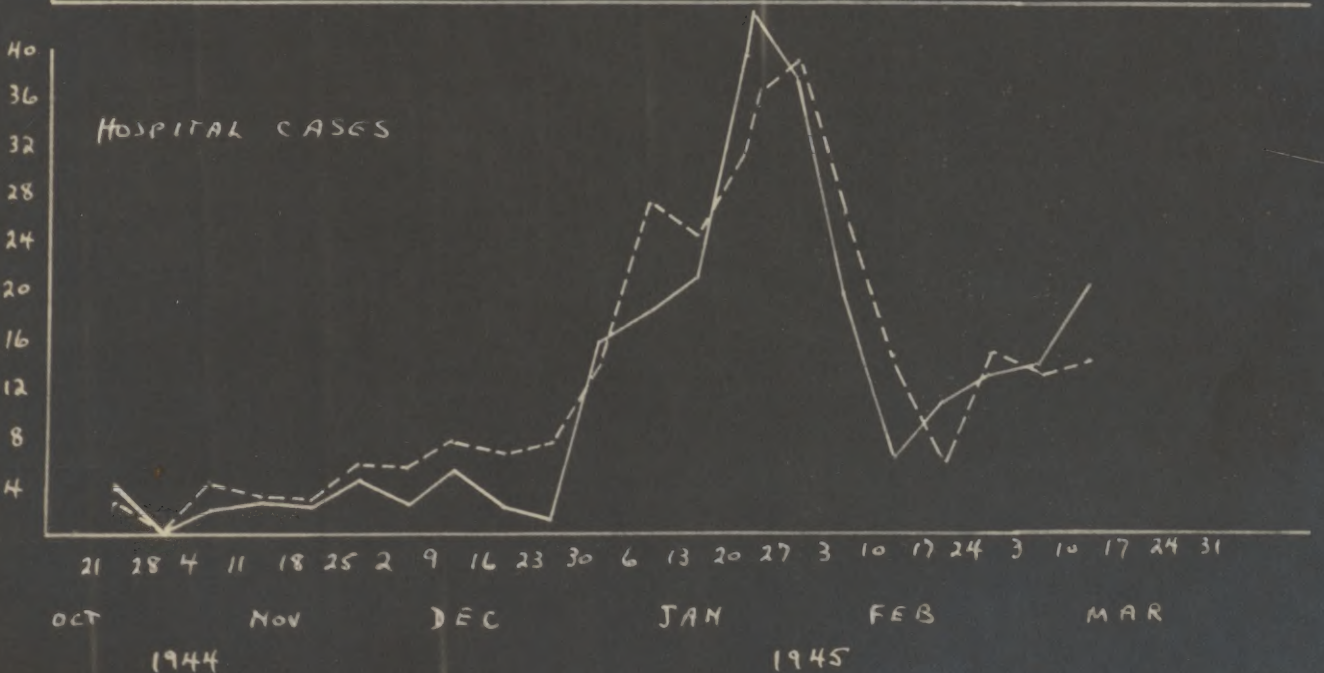
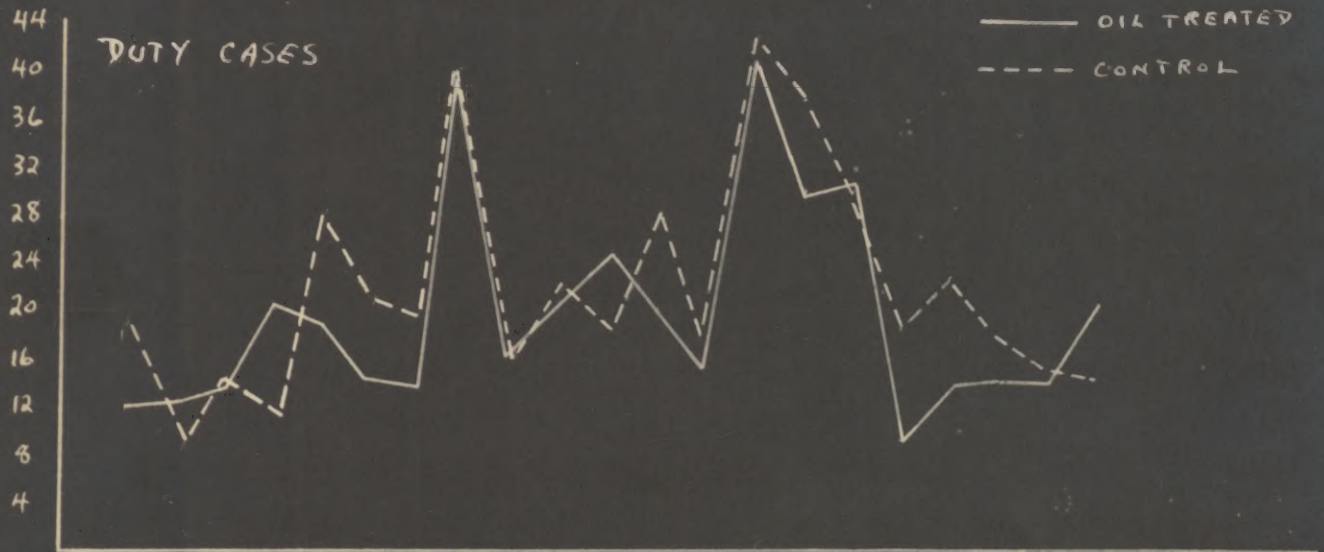


Table III

Weekly Incidence of Respiratory Disease in Oiled and Control Groups According to Severity: Duty, Quarters, and Hospital Cases

Oiled Group					Control Group						
		Mean	Cases					Mean	Cases		
		Strength	D	Q	H			Strength	D	Q	H
Endemic Period - 22 October to 30 December											
Oct.	22-28	981	12	4	4			963	19	4	3
	29-4	961	12	1				931	8	1	
Nov.	5-11	1509	21	5	3			1413	20	10	6
	12-18	1572	32	7	4			1520	18	17	4
	19-25	1978	37	23	4			1960	56	27	5
	26-2	1961	27	10	8			1949	42	18	11
Dec.	3-9	2562	34	29	6			2606	50	50	14
	10-16	2514	98	45	12			2630	104	62	20
	17-23	2242	37	9	7			2166	36	19	14
	24-30	2102	44	29	3			2309	52	23	17
Total			354	162	51				405	231	94
Epidemic Period - 31 December to 17 March											
Dec.	31-6	2138	52	41	34			2347	43	51	33
Jan.	7-13	2041	40	42	38			2129	60	59	58
	14-20	1985	30	41	42			2049	36	63	50
	21-27	1990	79	58	88			2041	85	57	75
	28-3	1938	57	53	72			1947	73	44	77
Feb.	4-10	1800	54	49	36			1723	51	37	46
	11-17	1811	16	11	12			1748	32	21	26
	18-24	1942	24	20	21			1993	40	19	12
	25-3	2116	29	28	28			2189	39	37	33
Mar.	4-10	2044	28	22	29			2110	32	23	29
	11-17	2228	41	32	42			2154	31	27	31
Total			450	397	442				522	438	470

Table III-A

Incidence Rates per 1000 per week

	Duty Cases		Quarters Cases		Hospital Cases	
	Oiled	Control	Oiled	Control	Oiled	Control
Endemic Period - 22 October to 30 December						
Oct. 22-28	12.2	19.7	4.1	4.2	4.1	3.1
29-4	12.5	8.6	1.0	1.1		
Nov. 5-11	13.9	14.1	3.3	7.1	2.0	4.2
12-18	20.4	11.8	4.5	11.2	2.5	2.6
19-25	18.7	28.6	11.6	13.8	2.0	2.6
26-2	13.8	21.5	5.1	9.2	4.1	5.6
Dec. 3-9	13.3	19.2	11.3	19.2	2.3	5.4
10-16	39.0	39.5	17.9	23.6	4.8	7.6
17-23	16.5	16.6	4.0	8.8	3.1	6.5
24-30	20.9	22.5	13.8	10.0	1.4	7.4

Epidemic Period - 31 December to 17 February

Dec. 31-6	24.3	18.3	19.2	21.7	15.9	14.1
Jan. 7-13	19.6	28.2	20.6	27.7	18.6	27.2
14-20	15.1	17.6	20.7	30.7	21.2	24.4
21-27	39.7	41.6	29.1	27.9	44.2	36.7
28-3	29.4	37.5	27.3	22.6	37.2	39.5
Feb. 4-10	30.0	29.6	27.2	21.5	20.0	26.7
11-17	8.8	18.3	6.1	12.0	6.6	14.9
18-24	12.3	20.1	10.3	9.5	10.8	6.0
25-3	13.7	17.8	13.2	16.9	13.2	15.1
Mar. 4-10	13.7	15.2	10.7	10.9	14.2	13.7
11-17	18.4	14.4	14.4	12.5	18.9	14.4

During the endemic period the incidence of quarters cases varied somewhat irregularly from 2 to 20 per thousand per week. Throughout this period the rates in the oiled group were consistently lower than the rates in the control group. The totals were 162 and 231 cases respectively. This difference represents a reduction in the oiled group of 30 per cent.

During the epidemic period there were no consistent differences in the weekly rates in the quarters cases from oiled and control groups, although the total cases were 397 and 438, respectively. This difference in the total cases constitutes a reduction, possibly due to the oiling procedures, of 9 per cent.

The results from tabulation of the total hospital cases as determined from dispensary records were similar to those found for quarters cases. During the endemic period there were 51 admissions from the oiled group and 94 from the control group, making a gross reduction of 46 per cent. During the epidemic, however, the number of admissions were 442 and 470 respectively, a difference of 6 per cent.

Adding quarters and hospital cases together the reduction during the endemic period was 34 per cent, and in the epidemic period the reduction was 8 per cent.

An analysis of these results by separate battalions, however, revealed several inconsistencies. In some battalions the incidence of quarters and hospital cases from oiled and control batteries was approximately equal while in other battalions rather marked differences occurred. One of these was the 7th Battalion in which the oiled and control batteries were less comparable than in the other organizations in the study group. Battery D, a control battery, was composed of para-troop volunteers. For part of the period the strength was greater than the other batteries of the battalion and the movement of troops through this battery was different. An unusually large number of cases occurred in this battery. If the 7th Battalion is omitted from the study the total reduction in incidence of quarters and hospital cases during the endemic period is lowered from 34 per cent to 25 per cent, and during the epidemic period the reduction becomes only 5 per cent.

B. Analysis of Hospital Cases -- The diagnoses of the cases which were examined in the hospital are shown in Table IV. The totals in this table are similar though not identical to those in Table III because of the different method of identifying the cases and because the tabulation includes cases admitted through 17 February.

Table IV

Diagnosis of Hospital Cases from Oiled and Control Groups

Diagnosis	Endemic Period 22 Oct. to 30 Dec.		Epidemic Period 31 Dec. to 17 Feb.	
	Oiled Group	Control Group	Oiled Group	Control Group
Acute Respiratory Illnesses				
ARD (Undifferentiated)	36	56	271	288
Exudative Pharyngitis	9	16	10	34
Atypical Pneumonia	11	14	21	20
Acute Bacterial Pneumonia		2	2	2
Total	56	88	304	344
Contagious Diseases				
Chicken Pox	1	1		
Measles			1	1
German Measles	1		8	16
Meningococcal Infections	1		1	2
Total	3	1	10	19
Exclusions				
Chronic Respiratory Diseases	4	6	13	12
Vaccinia and Typhoid Reactions	1	6	5	2
Not Respiratory Disease	2	2	2	6
Total	7	14	20	20
<u>Grand Total</u>	66	103	334	383

During both the endemic and epidemic periods the most frequent diagnosis was acute undifferentiated respiratory disease, which for convenience has been shortened to ARD. Exudative pharyngitis and atypical pneumonia occurred in small numbers and bacterial pneumonia and acute contagious diseases were infrequent. During the epidemic period, there was a marked increase in ARD but only slight increases in exudative pharyngitis and atypical pneumonia. The frequency of ARD and exudative pharyngitis was lower in the oiled group than in the control group during both periods. There was no difference in the incidence of atypical pneumonia.

A few sporadic cases of German measles occurred in small abortive outbreaks. The total number is too small to attribute the observed difference to the dust control measures.

These tabulations which are based on hospital cases and which are corrected for diagnosis indicate a crude reduction in the oiled group of 36 per cent in the endemic period and 12 per cent in the epidemic period.

A part of this reduction may be accounted for by hemolytic streptococcal infections. During both the endemic and epidemic periods fewer cases with hemolytic streptococci occurred in the oiled than in the control group (Table V).

Table V

Distribution of Beta-Hemolytic Streptococci in Hospital Cases of Acute Respiratory Illnesses from Oiled and Control Groups

	Endemic Period 22 Oct. to 30 Dec.		Epidemic Period 31 Dec. to 17 Feb.	
	Oiled Group	Control Group	Oiled Group	Control Group
Beta-Hemolytic Streptococci				
Present	9	23	24	38
Absent	47	65	280	306
Total	56	88	304	344
Percent Present	16.1	26.1	7.9	11.0

During the endemic period, three fourths of the hemolytic streptococci were Group A strains (Table VI), but during the epidemic period only one half were Group A strains. In both periods however, typable strains were obtained more frequently from the control than from the oiled group. Although the total number of cases is quite small the consistency of the differences and the greater frequency of typable strains in the control group suggest that the oiling procedures may have reduced the number of cases of hemolytic streptococcal disease. Antibody studies are necessary to establish this point.

Table VI

Distribution of Groups and Types of Hemolytic Streptococci
Isolated from Hospitalized Cases of Acute Respiratory Illness

Hemolytic Streptococci	Endemic Period 22 Oct. to 30 Dec.		Epidemic Period 31 Dec. to 17 Feb.	
	Oiled Group	Control Group	Oiled Group	Control Group
Group A -- Typable	4	12	3	10
No Type	3	6	10	11
Other Groups	2	5	10	15
No Group			1	2
Total	9	23	24	38

The distribution of total cases by battalions according to oiled and control groups is shown in Table VII. A larger number of cases occurred in the 9th Battalion during the epidemic period than in any other organization. This battalion was composed of the most recently inducted recruits and it had a considerably greater strength. Overcrowding resulted. The 5th Battalion completed training during the middle of the epidemic and the arrival of new recruits was delayed until the end of February. Hence the smallest number of cases occurred in this group.

Table VII

Distribution of Hospital Cases of Acute Respiratory
Illnesses by Battalions during Endemic and Epidemic Periods

Battalion	Endemic Period 22 Oct. to 30 Dec.		Epidemic Period 31 Dec. to 17 Feb.	
	Oiled Group	Control Group	Oiled Group	Control Group
5th	3	8	29	32
6th	8	25	39	59
7th	21	23	39	67
8th	12	23	51	56
9th	12	9	146	130
Total	56	88	304	344

Differences in incidence between oiled and control groups in the various battalions were not consistent. During the endemic period the incidence in the 5th, 6th, and 8th Battalions was reduced in the oiled group compared with the control. The 7th and 9th Battalions showed no difference.

During the epidemic period the only differences of significance occurred in the 6th and 7th Battalions. In the other 3 battalions the numbers of cases in the two groups were approximately equal. Preliminary corrections of these figures have been undertaken for variation in strength and in length of service of the men in the oiled and control groups in each battalion. As pointed out above, there were considerable differences in the 7th Battalion. When these corrections are completed the results will probably be modified materially.

On the basis of the data available at present it is reasonable to conclude that a part of the reduction which occurred during the endemic period may be attributed to the oiling procedures. The slight reduction in the epidemic period is of doubtful significance.

3. Platoon Studies

Platoon studies have been completed in two battalions. During November and December the prevalence of minor symptoms in both an oil treated platoon and a control platoon was approximately 50 per cent throughout a six-week period of observation. No changes or differences which could be attributed to the oiling procedures were observed. The weekly throat cultures in the control platoon revealed that a type 25 pneumococcus spread to 17 of the 60 men during the middle of the observation period. This spread occurred without evident relation to respiratory symptoms. A distribution of the carriers according to the bed plan (Figure 2) suggests that some of the spread occurred by direct contact to men in adjacent beds. A similar spread of bacteria in the oiled platoon was not observed.

The prevalence of minor symptoms in the two platoons studied during the epidemic period reached 80 per cent. Practically every man in both the oiled and control platoons had minor symptoms at some time during an eight-week period. Spread of type specific pneumococci or streptococci among the men was not observed.

4. Survey for Carriers of Hemolytic Streptococcus

In January and February, pharyngeal cultures were obtained from the trainees and cadre of the 9th Battalion during the 1st, 3rd, and 6th weeks of training. A complete series of 3 cultures were collected from 1123 men. The number of carriers found in this group is shown in Table VIII.

CONTROL PLATOON B-8-3 FA-RTC

CARRIERS OF TYPE 25 PNEUMOCOCCUS FOUND IN WEEKLY CULTURES
BY SLEEPING ARRANGEMENT 17 NOVEMBER TO 27 DECEMBER 1944.

Table VIII

Carrier Rates of Beta-Hemolytic Streptococci in Survey of 9th Battalion During 1st, 3rd, and 6th Week of Training, 27 December to 10 February

Carrier Rates Per cent

Culture Period	Oiled Batteries		Control Batteries		Total
	A	C	B	D	
1st 28 Dec. - 2 Jan.	12.2	7.5	7.4	11.3	9.6
2nd 15 Jan. - 20 Jan.	7.0	6.8	7.0	8.5	7.3
3rd 5 Feb. - 10 Feb.	9.8	7.1	4.8	7.0	7.1
Total Men Cultured*	287	280	272	284	1123

* Only those men from whom cultures were obtained in all 3 periods are included.

During this period there was a moderately severe epidemic of acute respiratory disease in which approximately 25 per cent of the men were hospitalized. The carrier rate for hemolytic streptococci, however, remained low. It fell from 9.6 to 7.1 per cent in the whole battalion. No differences were observed among the 4 batteries which could be attributed to the effect of the oiling procedures.

SUMMARY AND DISCUSSION

A control study of the effect of oiled floors and bedding has been conducted at Fort Bragg, N.C. in a group of approximately 4000 new recruits. The application of oil to both floors and bedding was found to be simple and practical under the conditions at this army post. The procedures were generally popular among both officers and enlisted men. They resulted in greater ease of cleaning barracks and almost total elimination of dust.

Throughout the period of the study the oiling procedures effectively controlled the bacterial content of the air in the treated barracks.

A summary of the results of the tabulation of dispensary and hospital records is presented in Table IX.

Table IX

Per cent "Reduction" in Cases of Respiratory
Disease from Oiled Group Compared with Control Group

Period of Observation	Dispensary Records		Hospital Cases Corrected for Diagnosis
	Quarters	Hospital	
Endemic (22 Oct. -30 Dec.)	30	46	36
Epidemic (31 Dec. -17 March)	9	6	12*

* Epidemic period, 31 Dec. - 17 Feb.

During the period of low incidence of respiratory disease from October to December, there were from 30 to 40 per cent fewer quarters and hospital cases from the oiled group than from the control group. A part of this reduction can reasonably be attributed to the oiling procedures.

During the epidemic period in January and February, the crude reduction in the quarters and hospital cases from the oiled group was not more than 10 per cent. Correlations of these figures for strength and other variations may eliminate this difference. The dust control measures did not prevent the development of epidemic respiratory disease.

There was suggestive evidence that cases of hemolytic streptococcal infection were reduced by the oiling procedures. The true incidence of streptococcal disease, however, depends upon completion of antibody studies.

Studies of the hemolytic streptococcal carrier rate in one battalion during an epidemic of acute respiratory disease showed similar carrier rates in the oiled and control groups.

Type specific pneumococci were observed to spread through one of the two control platoons but similar spread was not seen in two platoons which were housed in oiled barracks.

From a practical point of view the results indicate that oiling of floors and bedding had a moderate effect in reducing respiratory disease during a period of low, endemic incidence. The measures were ineffectual, however, in controlling an epidemic of acute respiratory disease in new recruits.

From a theoretical point of view the results throw light on the mode of spread of respiratory disease among troops. It would appear that contaminated dust in barracks was a contributing factor in the spread of endemic illnesses, but that this mode of spread was relatively unimportant during an epidemic. There was some evidence to suggest that dust was more important in the spread of hemolytic streptococcal disease than it was in acute respiratory disease of unknown etiology.

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Respectfully submitted,

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